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(54) ON BOARD CAMERA SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain an on board camera system where the night vision is not lost in the case of photographing at a dark place and a video image close to coloring viewed by human eyes can be obtained in the case of photographing at a bright place.

SOLUTION: A lightness detection section 6 gives lightness data around a detected point to a control section 5, the control section 5 discriminates whether or not the lightness

data received from the lightness detection section 6 are higher than a prescribed value. The control section 5 gives an infrared ray shut instruction to an infrared ray filter control section 7 when the lightness data are higher than the prescribed value and gives an infrared ray transmission instruction to the infrared ray filter control section 7 when the lightness data are smaller than the prescribed value. The infrared ray filter control section 7 selects infrared ray interruption/transmission of the infrared ray filter 2 according to the infrared ray shut/transmission instruction received from the control section 5 as its control so as to select shut/transmission of the infrared ray included in an object light made incident onto a light receiving face of an image pickup element 3.

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CLAIMS

[Claim(s)]

[Claim 1]. It has the following and is characterized by changing transmission quantity

of infrared light contained in object light which enters into said image sensor with directions of said control means. A mounted camera device which projects an image of a vehicle circumference on a display screen which changed into an electrical signal object light which enters into an image sensor via a taking lens, obtained a necessary video signal by carrying out signal processing suitably in a video signal processing circuit, and was installed in the car.

An infrared light filter into which transmission quantity of infrared light is changed ahead of said image sensor.

A control means which controls infrared light transmission quantity of this infrared light filter.

[Claim 2]The mounted camera device according to claim 1 which is provided with the following, makes transmission quantity of infrared light small for infrared light transmission quantity of said infrared light filter by said control means based on a detection result of said brightness detecting means in being bright, and is characterized by enlarging transmission quantity of infrared light in being dark.

A brightness detecting means which detects a luminosity at the time of photography.

A control means which controls infrared light transmission quantity of said infrared light filter based on a detection result of this brightness detecting means.

[Claim 3]The mounted camera device according to claim 1 which it has the following, and said vehicles light switches said infrared light filter to an infrared light penetration by said control means at the time of lighting, and is characterized by said vehicles light's switching said infrared light filter to infrared light interception, and picturizing it at the time of putting out lights.

A vehicles light detecting means which detects lighting and putting out lights of a vehicles light.

A control means which switches an infrared light penetration and interception of said infrared light filter based on a detection result of this vehicles light detecting means.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to a mounted camera device, and relates to the mounted camera device which projects the image of a vehicle circumference on the display screen especially installed in in the car.

[0002]

[Description of the Prior Art]CCD is almost used for the image sensor of the video camera device for inputting a picture now. CCD of a high resolution use also has millions of photo-diodes, and one unit called this pixel is correctly arranged in two dimensions in the accuracy of the micron unit. Therefore, since there is no figure distortion, the picture of the CCD camera is suitable for image processing.

[0003]Image formation of the image of a photographic subject is carried out to the acceptance surface of CCD via a taking lens, and it is spatially sampled by a photo-diode. The optical image by which image formation was carried out to the CCD image sensor is read as an electrical signal according to the scan of television. By CCD for vertical transfer, it transmits at a time perpendicularly one row of signal charges accumulated in the photo-diode, and they are sent to CCD for horizontal transfer. By CCD for horizontal transfer, the signal for one row sent from CCD for vertical transfer is sent to output amplifier for every scanning line, and is read as voltage.

[0004]Such a CCD camera is carried in vehicles and the trial about white line recognition of a running road and safe running, such as obstacle detection, is made.

The image picturized with this camera device is projected on the display screen installed in in the car, it is intelligible for a driver and the situation of the vehicle circumference is made.

[0005]And although it originally has not only a visible ray region but the sensitivity to an infrared light field in CCD itself which is an image sensor, Since the tone of the image to project turns into tone as which red was emphasized from the tone seen by people's eyes when CCD which has sensitivity to an infrared light field is used, conventionally, Install an infrared light filter before CCD, and he makes the light of an infrared light field not enter into an image sensor, and is trying to acquire the image of the tone near the tone seen by people's eyes.

[0006]

[Problem(s) to be Solved by the Invention]By the way, as mentioned above, when such a conventional video camera performs an image pick-up at a dark place, in order not to enter the light of an infrared light field into an image sensor, there is a problem of spoiling night vision nature. There was a problem that it was picturized by the tone as which red was emphasized from the tone as which the image regarded the object light which gives priority to night vision performance and contains the light of an infrared region by people's eyes on the occasion of an image pick-up at a bright place when it was made to enter into an image sensor.

[0007]As mentioned above, it is providing the mounted camera device which the purpose of this invention switches a penetration and interception of the light of the infrared light field included in the object light which enters into an image sensor, picturizes it by the tone near the tone seen by people's eyes in the time of photography at a bright place, and improves and picturizes night vision nature in photography at a dark place.

[0008]The purpose of this invention is to provide the mounted camera device which intercepts automatically the infrared light contained in object light in photography at a bright place according to the luminosity at the time of photography, enters into an image sensor, penetrates the infrared light contained in object light in photography at a dark place, and is entered and picturized to an image sensor.

[0009]The purpose of this invention is to provide the mounted camera device with which lighting and putting out lights of a vehicles light are interlocked with, a vehicles light penetrates the infrared light contained in object light at the time of lighting, and a vehicles light intercepts and picturizes the infrared light contained in object light at the time of putting out lights.

[0010]

[Means for Solving the Problem]According to this invention, an aforementioned problem changes into an electrical signal object light which enters into an image sensor via a taking lens, In a mounted camera device which projects an image of a vehicle circumference on a display screen which obtained a necessary video signal and was installed in in the car by carrying out signal processing suitably in a video signal processing circuit, It has an infrared light filter into which transmission quantity of infrared light is changed ahead of said image sensor, and a control means which controls infrared light transmission quantity of this infrared light filter, and is attained by mounted camera device which changes transmission quantity of infrared light contained in object light which enters into said image sensor with directions of said control means.

[0011]That is, if constituted as mentioned above, a penetration and interception of light of an infrared light field included in object light can be switched, and it can enter into an image sensor.

[0012]A brightness detecting means which detects a luminosity at the time of photography according to this invention in an aforementioned problem, It has a control means which controls infrared light transmission quantity of said infrared light filter based on a detection result of this brightness detecting means, Based on a detection result of said brightness detecting means, by said control means, in being bright, it makes transmission quantity of infrared light small for infrared light transmission quantity of said infrared light filter, and it is attained by mounted camera device which enlarges transmission quantity of infrared light when dark.

[0013]That is, if constituted as mentioned above, quantity of light of an infrared light field included in object light which enters into an image sensor can be automatically adjusted according to a luminosity at the time of photography, in being bright, it intercepts infrared light which enters into an image sensor, and when dark, infrared light which enters into an image sensor can be penetrated.

[0014]A vehicles light detecting means which detects lighting and putting out lights of a vehicles light according to this invention in an aforementioned problem, It has a control means which switches an infrared light penetration and interception of said infrared light filter based on a detection result of this vehicles light detecting means, Said vehicles light switches said infrared light filter to an infrared light penetration by said control means at the time of lighting, and said vehicles light is attained by mounted camera device which switches said infrared light filter to infrared light interception, and picturizes it at the time of putting out lights.

[0015]If constituted as mentioned above, corresponding [namely,] to lighting and

putting out lights of a vehicles light, Interception and a penetration of infrared light contained in object light which enters into an image sensor can be switched and picturized, a vehicles light intercepts infrared light which enters into an image sensor at the time of lighting, and a vehicles light can penetrate infrared light which enters into an image sensor at the time of putting out lights.

[0016]

[Embodiment of the Invention](A) The important section lineblock diagram 1 of the 1st example of the 1st example (A-1) is an important section lineblock diagram of the 1st example of this invention. 1 in drawing 1 A taking lens, the infrared light filter which 2 can switch [of a penetration and interception of infrared light], The control section by which 3 controls an image sensor (CCD), 4 controls a video signal processing section, and 5 controls the whole camera, the luminosity primary detecting element where 6 detects the luminosity at the time of photography, and 7 are infrared light filter control parts which switch a penetration and interception of the infrared light of the infrared light filter 2.

[0017]The taking lens 1 is a thing which condenses object light and carries out image formation to the acceptance surface of the image sensor 3 via the infrared light filter 2. As for the infrared light filter 2, a penetration and interception of infrared light are controlled by the below-mentioned infrared light filter control part.

[0018]The image sensor 3 is CCD for colors, and is provided with the light-receiving diode group (pixel group) by which the matrix array was carried out to the acceptance surface, the vertical-charge-transfer way group by which contiguity formation was carried out via the transfer gate at this pixel group, and the horizontal charge transfer path formed in the end part of a vertical-charge-transfer way group. And all the pixel electric charges accumulated in the pixel group at exposure time shorter than a field period, while making it transmit to a single-tier [every] horizontal charge transfer path synchronizing with the scanning read control signal which carries out charge transfer to a vertical-charge-transfer way group via the end of exposure time, simultaneously a charge transfer gate, and is further impressed to the transfer electrode group provided in the vertical-charge-transfer way group -- a dot order -- it has structure which reads each pixel electric charge next.

[0019]The video signal processing section 4 outputs the video signal of NTSC system to it, for example, after carrying out predetermined signal processing to each pixel electric charge read from the image sensor 3 including a white balance circuit, a gamma correction circuit, a matrix circuit, an encoder circuit, etc.

[0020]The control section 5 controls the whole video camera, and controls an infrared

light penetration and interception of the infrared light filter 2 to the infrared light filter control part 7 based on the detection result of the below-mentioned luminosity primary detecting element 6.

[0021]The luminosity primary detecting element 6 inputs into the control section 5 the luminosity data which detects the luminosity of the circumferences, such as an illuminometer, and was detected. That is, the luminosity primary detecting element 6 detects the surrounding luminosity at the time of an image pick-up, and inputs the detected luminosity data into the control section 5.

[0022]According to penetration / interception directions of the infrared light from the control section 5, by driving a motor (not shown), the infrared light filter control part 7 carries out the roll control of the below-mentioned infrared light diaphragm blade, and switches a penetration and interception of the infrared light of the infrared light filter 2.

[0023]At the time of photography with a video camera, the luminosity primary detecting element 6 detects the surrounding luminosity, and inputs luminosity data into the control section 5, and the control section 5 inputs infrared light interception directions of the infrared light filter 2 into the infrared light filter control part 7, when the luminosity data inputted from the luminosity primary detecting element 6 is more expensive than a predetermined value. On the other hand, when luminosity data is lower than a predetermined value, infrared light penetration directions of the infrared light filter 2 are inputted into the infrared light filter control part 7.

[0024]The infrared light filter control part 7 sets up a penetration or interception of the infrared light of the infrared light filter 2 according to infrared light penetration / interception directions inputted from the control section 5.

[0025]And the video signal processing section 4 carries out predetermined signal processing to each pixel electric charge read from the image sensor 3, and outputs a video signal to it.

[0026]As mentioned above, according to the luminosity at the time of photography, when brighter than a predetermined value, setting out of an infrared light filter can be set as infrared light interception, when darker than a predetermined value, setting out of an infrared light filter can be set as an infrared light penetration, and the amount of infrared light contained in the object light which enters into an image sensor can be adjusted.

[0027](A-2) The lineblock diagram 2 of an infrared light filter is an explanatory view of the infrared light filter 2. As shown in the figure, the infrared light filter 2 is provided with the infrared light diaphragm blades R1-R8 of plurality (for example, eight sheets). Each infrared light diaphragm blade is a thing of the construction material which

intercepts the light of an infrared region and penetrates the light of a light range.

[0028]The infrared light diaphragm blades R1–R8 have the structure of changing area of opening OS, by being made of a filter material which intercepts the light of an infrared light field, respectively, and rotating an infrared light diaphragm blade by the motor which is not illustrated. In photography at a bright place, by making area of opening OS small, transmission quantity of the infrared light contained in object light is made small, and transmission quantity of the infrared light contained in object light is enlarged by enlarging area of opening OS in photography at a dark place.

[0029]Drawing 3 (a) is an example in the case of intercepting the infrared light contained in object light, and is an example at the time of controlling the infrared light diaphragm blades R1–R8, and making area of opening OS into the minimum. Drawing 3 (b) is an example in the case of penetrating the infrared light contained in object light, and is an example at the time of controlling the infrared light diaphragm blades R1–R8, and making area of opening OS into the maximum. Thus, the infrared light filter 2 adjusts the amount of infrared light contained in the object light which enters into the acceptance surface of the image sensor 3.

[0030](A-3) Operation flow drawing 4 of the 1st example is a figure showing the operation flow of the 1st example. First, the luminosity primary detecting element 6 detects the surrounding luminosity, inputs luminosity data into the control section 5 (Step S101), and the control section 5, The luminosity data inputted from the luminosity primary detecting element 6 is compared with the predetermined value memorized in the built-in memory (not shown), and it is judged whether the surrounding luminosity is brighter than a predetermined value (Step S102).

[0031]At Step S102, when the surrounding luminosity is beyond a predetermined value, The control section 5 points to interception of the light of an infrared region to the infrared light filter control part 7, The infrared light filter control part 7 is set up rotate the infrared light diaphragm blades R1–R8 of the infrared light filter 2 by driving a motor (not shown), change opening OS into a full-close state, and intercept infrared light (Step S103).

[0032]On the other hand, at Step S102, when the surrounding luminosity is smaller than a predetermined value, The control section 5 points to the penetration of the light of an infrared region to the infrared light filter 7, and sets up the infrared light filter control part 7 rotate the infrared light diaphragm blades R1–R8 of the infrared light filter 2 by driving a motor (not shown), make opening OS into an opened state, and penetrate infrared light (Step S104).

[0033]And at Step S103 or Step S104, after ending infrared light penetration /

interception setting out of the infrared light filter 2, the video signal processing section 4 reads the pixel electric charge accumulated in the image sensor 3, performs predetermined signal processing, and outputs a video signal (Step S105).

[0034]If it is made above, the surrounding luminosity is detected in the case of photography, when the surrounding luminosity is brighter than a predetermined value, the infrared light contained in object light is intercepted, and when the surrounding luminosity is darker than a predetermined value, the object light containing infrared light can be penetrated and picturized.

[0035]In explanation of the 1st example of the above, although setting out of the infrared light filter 2 was switched in two steps of infrared light interception and a penetration based on whether the luminosity at the time of photography is beyond a predetermined value, It may be made to set up finely the area of opening OS of the infrared light diaphragms R1-R8 according to the luminosity at the time of photography. The transmission quantity of the infrared light contained in object light in such a case according to the luminosity at the time of photography can be adjusted finely.

[0036](B) The important section lineblock diagram 5 of the 2nd example of the 2nd example (B-1) is an important section lineblock diagram of the 3rd example of this invention, The control section by which a taking lens and 2 control an infrared light filter, 3 controls an image sensor (CCD), and, as for 1, a video signal processing section and 5' control the whole video camera, as for 4, the incident-light-quantity primary detecting element where 6' detects the incident light quantity at the time of photography, and 7 are infrared light filter control parts.

[0037]The taking lens 1, the infrared light filter 2, the image sensor 3, the video signal processing section 4, and the infrared light filter control part 7 are the same as that of the thing of explanation at drawing 1.

[0038]Control-section 5' controls the whole video camera, and directs the switching control of an infrared light penetration and interception of the infrared light filter 2 to the infrared light filter control part 7 based on the detection result of below-mentioned incident-light-quantity primary detecting element 6'.

[0039]Based on the pixel electric charge accumulated by the light which received light in the acceptance surface of the image sensor 3, incident-light-quantity primary detecting element 6' detects the light volume which enters into the image sensor 3 from the charge quantity accumulated in each pixel of the image sensor 3, and inputs the detected incident-light-quantity data into control-section 5'.

[0040]The infrared light filter control part 7 carries out the roll control of the infrared

light diaphragm blades R1-R8 of the infrared light filter 2 by driving a motor (not shown) according to infrared light interception / penetration directions inputted from control-section 5', and switches interception and a penetration of infrared light.

[0041](B-2) Operation flow drawing 6 of the 2nd example is a figure showing the operation flow of the 2nd example of this invention. First, the incident-light-quantity data into which incident-light-quantity primary detecting element 6' detected the light volume which enters into the image sensor 3 via the taking lens 1, and inputted incident-light-quantity data into control-section 5' (Step S201), and control-section 5' was inputted, The predetermined value memorized in the built-in memory (not shown) is compared, and it is judged whether the light volume which enters into the image sensor 3 is larger than a predetermined value (Step S202).

[0042]At Step S202, when incident light quantity is larger than a predetermined value, Control-section 5' performs infrared light interception directions to the infrared light filter control part 7, The infrared light filter control part 7 is set up rotate the infrared light diaphragm blades R1-R8 of the infrared light filter 2 in the direction closed by driving a motor (not shown), change the area of opening OS into a full-close state, and intercept infrared light (Step S203).

[0043]On the other hand, at Step S202, when incident light quantity is smaller than a predetermined value, Control-section 5' performs infrared light penetration directions to the infrared light filter control part 7, The infrared light filter control part 7 is set up rotate the infrared light diaphragm blades R1-R8 of the infrared light filter 2 in the direction opened by driving a motor (not shown), make area of opening OS into an opened state, and penetrate infrared light (Step S204).

[0044]And at Step S203 or Step S204, after ending infrared light penetration / interception setting out of the infrared light filter 2, the video signal processing section 4 reads the pixel electric charge accumulated in the image sensor 3, performs predetermined signal processing, and outputs a video signal (Step S205).

[0045]If it is made above, according to the quantity of the light which enters into an image sensor via a taking lens, can adjust the quantity of the light of the infrared light field included in object light, and at the time of photography at a bright place. It can picturize by the tone near the tone seen by people's eyes, and can picturize at the time of photography at a dark place, without spoiling night vision nature.

[0046](C) The important section lineblock diagram 7 of the 3rd example of the 3rd example (C-1) is an important section lineblock diagram of the 3rd example of this invention. The 3rd example is an example at the time of applying this invention to the device which photos the image of a vehicle circumference with the camera carried in

vehicles.

[0047]In drawing 7, as for a taking lens and 2, an image sensor and 4 are infrared light filter control parts, and an infrared light filter and 3 of 1 are [a video signal processing section and 7] the same as that of the thing of explanation at drawing 1.

[0048]The control section by which 5'' controls the mounted whole camera, and 8 are light lighting primary detecting elements which detect turning on and off of the light switch of vehicles.

[0049]It is connected to the light switch of vehicles, and the light lighting primary detecting element 8 detects [to which the light of vehicles is on / or or] whether the light is put out, and outputs lighting / putting-out-lights information on a vehicles light to control-section 5''.

[0050]Control-section 5'' points to an infrared light penetration and interception of the infrared light filter 2 to the infrared light filter control part 7 based on the lighting information of the vehicles light from the light lighting primary detecting element 8.

[0051]The infrared light filter control part 7 carries out the roll control of the infrared light diaphragm blades R1-R8 of the infrared light filter 2 by driving a motor (not shown) according to the directions from control-section 5'', and carries out setting-out control of a penetration and the interception of infrared light.

[0052](C-2) Operation flow drawing 8 of the 3rd example is a figure showing the operation flow of the 3rd example of this invention. First, control-section 5'' judges [to which the vehicles light is on / or or] whether the light is put out based on the vehicles light information that it is inputted from the light switch primary detecting element 8 (Step S301).

[0053]At Step S301, if a vehicles light is lit, control-section 5'' will send infrared light penetration directions to the infrared light filter control part 7, and the infrared light filter control part 7, The infrared light diaphragms R1-R8 of the infrared light filter 2 are rotated by driving a motor (not shown), and the area of opening OS is set as an opened state (Step S303).

[0054]At Step S301, if the vehicles light has gone out, on the other hand, control-section 5'' will send infrared light interception directions to the infrared light filter control part 7, and the infrared light filter control part 7, The infrared light diaphragms R1-R8 of the infrared light filter 2 are rotated by driving a motor (not shown), and the area of opening OS is set as a full-close state (Step S304).

[0055]At Step S303 or Step S304, after infrared light interception setting out of the infrared light filter 2 is completed, the video signal processing section 4 reads the pixel electric charge accumulated in the image sensor 3, performs prescribed processing,

and outputs a video signal (Step S305).

[0056]If it is made above, at the time of lighting of a vehicles light, the object light containing the light of an infrared light field is entered into an image sensor (when dark in a vehicle circumference), and at the time of putting out lights of a vehicles light, the object light except the light of the infrared light field can be entered into an image sensor (when bright in a vehicle circumference). That is, lighting and putting out lights of a vehicles light can be interlocked with, and a penetration and interception of the infrared light contained in the object light which enters into the image sensor of a camera can be switched.

[0057]As mentioned above, although the example explained this invention, according to the main point of this invention indicated to the claim, various modification is possible for this invention, and this invention does not eliminate these.

[0058]

[Effect of the Invention]As mentioned above, according to this invention, infrared light penetration / interception setting out of an infrared light filter is performed, and since the amount of infrared light contained in the object light which enters into an image sensor was switched, the incident light quantity of infrared light can be switched by a user's liking. That is, by photography at a bright place, the image of the tone near the tone which intercepted the infrared light contained in object light, and was seen by people's eyes can be acquired, on the other hand, by photography at a dark place, the object light which contained infrared light in the image sensor can be entered, and night vision nature can be improved.

[0059]According to this invention, according to the luminosity at the time of photography, the object light except the light of the infrared light field is entered into an image sensor in the case of photography at a bright place, Since the object light which contains the light of an infrared light field in the case of photography at a dark place was made to enter into an image sensor, while being able to picturize an image by the tone near the tone seen by people's eyes when the circumference was bright, night vision nature when the circumference is dark can be improved at the time of photography at the time of photography.

[0060]Since according to this invention lighting and putting out lights of a vehicles light are interlocked with and infrared light interception / penetration setting out of the infrared light filter was switched, at the time of vehicles light lighting. The object light which contains infrared light in an image sensor is entered, and at the time of vehicles light putting out lights, the object light except infrared light can be entered into an image sensor, and it is convenient for it.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is an important section lineblock diagram of the video camera of the 1st example.

[Drawing 2] It is an explanatory view of an infrared light filter.

[Drawing 3] It is a figure showing the example of an infrared light penetration and interception of an infrared light filter.

[Drawing 4] It is a figure showing the operation flow of the 1st example.

[Drawing 5] It is an important section lineblock diagram of the video camera of the 2nd example.

[Drawing 6] It is a figure showing the operation flow of the 2nd example.

[Drawing 7] It is an important section lineblock diagram of the mounted camera of the 3rd example.

[Drawing 8] It is a figure showing the operation flow of the 3rd example.

[Description of Notations]

1 ... Taking lens

2 ... Infrared light filter

3 ... Image sensor

4 ... Video signal processing section

5 ... Control section

6 ... Luminosity primary detecting element

7 ... Infrared light filter control part